REMARKS

Claims 1-5 are pending in this application. Applicants respectfully request reconsideration of the pending claims.

Applicant appreciates the courtesies shown to Applicant's representatives by Examiner Listvoyb in the January 8, 2008, interview. Applicant's separate record of the substance of the interview is incorporated into the following remarks.

I. Rejection Under 35 U.S.C. §103(a)

Claims 1-5 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over RU 2017866 ("Chernykh") in view of U.S. Patent No. 5,646,234 ("Jung") and in further view of Encyclopedia of Pol. Sci. and Tech, Polyamides, vol. 3, p. 565-567 ("Encyclopedia"). Applicants respectfully traverse this rejection.

The Patent Office alleges that it would have been obvious to one of ordinary skill in the art to take the polymers disclosed in Chernykh and Jung and expand the applicability using the technology disclosed in Encyclopedia. See Office Action, page 4. Applicants respectfully disagree.

Specifically, Chernykh or Jung do not disclose a crumb, as the processes disclosed in Chernykh or Jung directly process a polymer from a solution. Nothing in any of the references would have led one of ordinary skill in the art to have modified the different compositions of Chernykh or Jung to the composition of claim 2 with any reasonable expectation of success in being able to obtain the composition in crumb form. Nor would the references have led one of ordinary skill the art to the process of claim 1, as the references fail to teach or suggest how to obtain the composition in crumb form as recited in claim 2.

A. Encyclopedia

Encyclopedia, cited by the Patent Office as allegedly suggesting the composition and process of claims 1-5, actually illustrates why the references would not have led one of

ordinary skill in the art to the present claims. Encyclopedia discloses that the copolymerization of para-phenylenediamine ("PPD") and terephthaloyl dichloride ("TDC") leads to an aromatic polyamide (PPTA) in the form of a crumb. See Encyclopedia, page 565, lines 14-20. These crumbs are known and highly desired as the purification of crumbs is relatively easy and the processability is high. See page 2, lines 10-11 of the specification. However, Encyclopedia does not teach or suggest replacing a portion of the PPD with 5(6)-amino-2-(p-aminophenyl)-benzimidazole ("DAPBI"). No specific requirements to make a crumb must be met when using PPD alone as in Encyclopedia. However, Applicants alone have determined that if a portion of the PPD is replaced by DAPBI, the proper ratio of PPD, DAPBI and calcium chloride must be used or the aramid polymer will not form a crumb, but a sticky paste, dough or powder. See page 2, lines 21-22 of the specification.

Such sticky materials have a low processability, and thus there is a need for a process using DAPBI that nevertheless renders crumbs. The method recited in claim 1 provides a solution to this problem in performing the polymerization using a specific solvent (N-methyl pyrrolidone ("NMP")-$CaCl_2$) within narrow boundaries of amounts.

As such, none of the references teach or suggest how one could replace a portion of PPD with DAPBI and still obtain a crumb. Further, none of the references teach or suggest (1) the modification of PPD with DAPBI and (2) the amounts of PPD, DAPBI and calcium chloride required to obtain a crumb. Thus, it would not have been obvious to one of ordinary skill in the art to have combined the teachings of Chernykh with Jung to form the crumb obtained in Encyclopedia using a different composition.

B. Chernykh

The Patent Office alleges that Chernykh discloses a method for producing an aromatic polyamide (aramid) comprising para-phenylene terephthalamide and 2-(p-phenylene)benzimidazole terephthalamide units by copolymerizing: (1) 10-80 mole percent of

PPD, (2) 10-80 mole percent of DAPBI, and (3) 100 mole percent of TDC in a mixture of NMP and calcium chloride or lithium chloride. See Office Action, page 2, citing Chernykh, Example 1. Applicants respectfully disagree.

Chernykh fails to teach or suggest the composition of claim 2, a composition in crumb form, or how to obtain the composition of claim 2 in crumb form by the use of the specific process (solvents and amounts of materials) of claim 1.

Example 1 of Chernykh discloses a method for producing an aromatic polyamide by copolymerizing: (1) 40 mole percent of 2-chloro-para-phenylenediamine (Cl-PPD); (2) 60 mole percent of DAPBI and (3) 100 mole percent of TDC in a mixture of anhydrous N,N-dimethylacetamide ("DMAC") and lithium choloride.

In contrast, claim 2 of the present application recites a composition comprising an aromatic polyamide containing para-phenylene terephthalamide and 2-(p-phenylene)benzimidazole terephthalamide units obtained by copolymerizing PPD, DAPBI and TDC in a mixture of NMP and calcium chloride, wherein the composition is a crumb with a relative viscosity ηrel of at least 4. Also, claim 1 of the present application recites a method for producing an aromatic polyamide containing para-phenylene terephthalamide and 2-(p-phenylene)benzimidazole terephthalamide units by copolymerizing: (i) a mole percent of PPD (not Cl-PPD as in Chernykh), (ii) b mole percent of DAPBI and (iii) 90 to 110 mole percent of TDC, in a mixture of NMP and containing c weight percent of calcium chloride (not in DMAC and lithium chloride as in Chernykh), wherein c is within the range from 1 to 20, and wherein the ratio a : b ranges from 1 : 20 to 20 : 1, a + b is 100 mole%, and i), ii), and iii) together comprise 1-20 wt.% of the mixture, wherein the product b x c is at least 50 and less than 215 and that the composition is a crumb with a relative viscosity ηrel of at least 4, wherein the crumb is defined as non-sticky particles at least 95% of which having an average diameter of 0.7-15 mm.

The composition and method disclosed in Example 1 of Chernykh are different than the composition and method recited in the present claims. Example 1 of Chernykh discloses (1) a different phenylenediamine (Cl-PPD vs. PPD), (2) a different salt (lithium chloride v. calcium chloride) and (3) a different solvent (DMAC v. NMP) than required in claim 2 in order to obtain a crumb form of the composition. As such, Example 1 of Chernykh does not teach or suggest the composition of an aromatic polyamide recited in claim 2.

Claim 1 recites that the mole percent sum of PPD (a) and DAPBI (b) is 100%. Example 1 of Chernykh includes 60 mole percent DAPBI, but does not disclose 40% PPD. Instead, Example 1 of Chernykh only discloses 40 mole percent Cl-PPD, which is different than PPD. As such, the mole percent sum of the present claims (a + b) using the data of Example 1 is only 60 mole percent (a=0, b=60) and not 100 mole percent as recited in the present claims. As such, Example 1 of Chernykh does not teach or suggest the method or process of making an aromatic polyamide recited in claim 1.

Although not mentioned by the Patent Office in the Office Action, Example 9 of Chernykh ("Example 9") does use calcium chloride in combination with NMP, and is thus the only potential relevant example. However, the composition and method disclosed in Example 9 of Chernykh are also different than the composition and method recited in the present claims.

Example 9 also does not use PPD, but 2,5-diaminomethoxybenzene. As such, Example 9 of Chernykh does not teach or suggest the composition of an aromatic polyamide recited in claim 2.

Further, according to Table 2, the calcium chloride concentration of Example 9 is 4.8 mole percent and the DAPBI concentration is 60 mole percent. Claim 1 requires the product of b (mole percent of DAPBI) and c (mole percent of calcium chloride) to be greater than 50 but less than 215 [$50 < (b \times c) < 215$]. However, the product of b and c in Example 9 is 288

(4.8 x 60) using the data from Example 9, and is thus outside of the upper limit of 215 recited in claim 1. As such, Example 9 does not teach or suggest the use of 1) DAPBI and 2) calcium chloride in the necessary amounts recited in claim 1.

Chernykh thus describes a different composition and method of making the composition, that is not in crumb form, and nothing in Chernykh directs one of ordinary skill in the art to derive the present composition of claim 2 in crumb form, or how to make the crumb of claim 1.

C. Jung

The Patent Office alleges that Jung discloses a method for producing an polyamide by the polycondensation of 100 mole percent TDC, 60 mole percent DAPBI (a) and 40 mole percent PPD (b) in NMP where the sum of a and b is 100 mole percent and relative viscosity is 4.3. See Office Action, page 3, citing Jung, Example 8. Applicants respectfully disagree.

Jung also fails to teach or suggest the composition of claim 2, a composition in crumb form, or how to obtain the composition of claim 2 in crumb form by the use of the process (solvents and amounts of materials) of claim 1.

Example 1 of Jung does not disclose the solvent mixture of NMP and calcium chloride, but the single solvent NMP. As such, the Examples listed in Jung do not teach or suggest the use of a mixture containing calcium chloride and NMP when forming an aromatic polyamide as required in claim 2.

Jung discloses the solubility additive can include a broad range of alkali metal halides, such as lithium chloride, or alkaline earth metal halides, such as calcium chloride or magnesium bromide. However, Jung is silent as to whether lithium chloride, calcium chloride or magnesium bromide should be used in a method for producing an aromatic polyamide by the polycondensation of the components recited in claim 2.

Further, Jung does not disclose the method recited in claim 1. Jung does not disclose the required amount of DAPBI for producing an aromatic polyamide by copolymerizing a mixture comprised of 60 mole percent DAPBI, which would be between 0.84 and 3.6% of the mixture. In contrast, Jung only mentions a mixture including a broader range of 0.2 to 10% DAPBI and a preferred range of 0.5 to 5% DAPBI. However, as stated above, claim 1 requires the product of b (mole percent of DAPBI) and c (mole percent of calcium chloride) to be greater than 50 but less than 215 [$50 < (b \times c) < 215$]. As such, the broad range and the preferred range yield a range of 12 to 600 and 30 to 300, respectively, and thus do not suggest the range of claim 1.

Jung thus also describes a different composition not in crumb form and a method of making the composition not in crumb form. As such, nothing in Jung would have directed one of ordinary skill in the art to have derived the composition of claim 2 in crumb form or the method for making the crumb of claim 1, as recited in the present claims.

D. Conclusion

As such, none of the references teach or suggest (1) the composition in crumb form as recited in claim 2 or (2) the method to make the composition in crumb form as recited in claim 1. Applicants respectfully request withdrawal of the rejection.

II. Interview

During the interview, the Patent Office alleged that the presently claimed subject matter is obvious as the starting materials used to make a DAPBI-containing aramid crumb or any crumb can be divided into three categories mappable on a Gibbs-Roseboom Phase Triangle ("Phase Triangle") that allegedly would indicate the concentrations where a crumb is derived. These categories are (1) the precipitate concentration, (2) the polymer concentration and (3) the solvent concentration that form the three sides of the Phase Triangle. The Examiner then stated that at a predetermined amount of polymer and solvent, a crumb

precipitate will form. The Examiner argued that one of ordinary skill in the art can simply examine the Phase Triangle and determine the necessary concentrations of the precipitate, polymer and solvent that will form the 5(6)-amino-2-(p-aminophenyl)-benzimidazole ("DAPBI") containing aramid crumb. Applicant respectfully disagrees with the Patent Office's allegations.

First, the Patent Office's allegations assume that the selection of polymer materials (para-phenylenediamine ("PPD"), DAPBI and terephthaloyl dichloride ("TDC")) and solvent materials (N-methyl pyrrolidone ("NMP") and calcium chloride) to form the precipitate crumb is taught or suggested by the references. However, as detailed above, the cited references do not teach or suggest the selection of the materials recited in claims 1 and 2, and thus one would not have found it obvious to have used the recited materials together, and would not have known to have attempted to derive the alleged Phase Triangle.

Second, it is not clear how the alleged Phase Triangle would be applicable. A phase diagram illustrates equilibrium conditions for the various physical phases of a material. The Patent Office apparently alleges formation of a diagram in which all of the different concentrations of materials are mapped with respect to the form of the product derived from each of the materials and concentrations. Such is not a phase diagram. Further, nowhere has the art taught or suggested preparing such a diagram for indicating when a crumb is derived at all and thus nowhere teaches or suggests preparing such a diagram for the particular materials recited in the claims. It is the Applicant that has discovered the materials to use and concentrations thereof to derive a crumb. Inventiveness cannot be defeated by a hindsight allegation that if the Applicant had undertaken the exhaustive and potentially fruitless process of mapping all possible concentrations of the recited materials, then a region where a crumb could be derived would have been apparent. The Patent Office's reasoning, as advanced during the interview, is clearly impermissible hindsight as it is based on one knowing what

materials to use together and then evaluating which concentrations yield a crumb, neither of which is taught or suggested in the cited references.

Third, the concentration of a single copolymer is not the lone factor in deriving a crumb. As recited in claim 1, the concentration of multiple materials that form the copolymer is also a factor. It is not clear how the alleged Phase Triangle would encompass all of these materials and concentrations. The Patent Office's alleged phase triangle considering only the concentration of the copolymer would be insufficient.

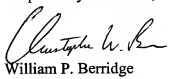
The Patent Office's reasoning on the use of the Phase Triangle, as asserted during the interview, thus also does not properly establish or indicate that the present claims would have been obvious from the cited references.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-5 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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